1 Introduction

1.1 General

The United States Environmental Protection Agency (USEPA) and General Motors Corporation (GM) have entered into a performance-based Resource Conservation and Recovery Act (RCRA) Corrective Action Agreement (Agreement) with the effective date of April 27, 2005. Pursuant to the Agreement, GM has worked in cooperation with USEPA to investigate, and as necessary, stabilize and remediate releases of hazardous wastes or hazardous constituents at or from Allison Transmission (the Facility) located in Indianapolis and Speedway, Indiana (EPA ID IND006413348 for Plants 3 and 12/14, and IND000806828 for Plant 2). In August 2007, GM sold Allison Transmission, which included the Facility, to Clutch Operating Company, Inc. (who now operates the Facility as Allison Transmission, Inc. (Allison)). However, as part of the sale GM retained responsibility for certain existing environmental issues at the Facility, including completing Corrective Action. The Facility and surrounding properties are shown on Drawing 1.1.1. This report was prepared to fulfill the requirements of Section V.1.b in the Agreement.

A Description of Current Conditions Report (DOCC) was prepared by ARCADIS G&M, Inc. (ARCADIS) in July 2005. The DOCC was prepared as one of the initial steps in the RCRA Corrective Action process on behalf of Environmental Corporate Remediation Company, Inc. (ENCORE), a wholly owned subsidiary of GM who is responsible for administering Corrective Action at this Facility. As required by the Agreement, the DOCC discussed the solid waste management units (SWMUs) and areas of concern (AOCs) identified by USEPA in the preliminary assessment and visual site inspections (PA/VSI) (dated September 28, 1993), as well as other areas of interest not identified by USEPA that may require further action. To facilitate future work, SWMUs, AOCs, and the other areas of interest were combined, generally by geographic location, into areas of interest (AOIs). Table 1.1.1 presents each AOI with its corresponding SWMU or AOC, where appropriate, and a description of the AOI and its location. This report documents activities conducted through March 2008.

1.2 Facility Description

The Facility includes six plants, Plants 2, 3, 6, 7, 12 and 14. Plants 3, 6, and 7 are connected and are commonly referred to as Plant 3. Therefore, Plant 3 will be used throughout the remainder of this report to refer to Plants 3, 6, and 7. Additionally, Plants 12 and 14 are connected and will be referred to as Plant 12/14 throughout the

remainder of this report. Drawing 1.1.1 shows the topographic location of the Facility. An aerial view of the site is presented in Drawing 1.2.1. The boundaries of Plant 2, Plant 3 and Plant 12/14 are shown on Drawing 1.2.2. EPA ID Number IND0000806828 is assigned to Allison Transmission for Plant 2 and IND006413348 is assigned to Allison Transmission for Plant 3 and Plant 12/14. The former Plant 12/14 USEPA ID Number IND000806802 is currently assigned to ENCORE for any hazardous waste management activities that ENCORE may experience in carrying out GM's retained environmental responsibilities at the Facility (waste disposal, permits, etc.).

1.2.1 Facility Location

Allison is located in the town of Speedway and the city of Indianapolis, Wayne Township, Marion County, Indiana (Drawing 1.1.1).

Plant 2 is located at 4500 West Gilman Avenue, Speedway, and previously occupied approximately 490,605 square feet (sq ft) of floor space on approximately 20.3 acres. Plant 3 is located at 4700 West 10th Street, Speedway, and occupies approximately 2,176,073 sq ft of floor space on approximately 137.1 acres. Plant 12/14 is located at 901 Grande Avenue, Indianapolis, and occupies approximately 1,016,114 sq ft of floor space on approximately 62.3 acres.

1.2.2 Property Ownership History

It is not known when Allison obtained ownership of the parcels comprising Plant 3 but the initial buildings were constructed in 1939. It is not known when Allison obtained ownership of the parcels comprising Plant 12/14 but the Plant 12 building was constructed in 1976. Construction of the Plant 14 building was completed in 1980.

Plant 2 was the site of a former United States Army base. The exact date when Allison obtained ownership of Plant 2 is unknown but the Plant 2 building was initially built in 1936. From 1973 through 1993, GM owned a parcel north of Plant 2. The parcel was owned by Union Carbide prior to 1973 and GM transferred the parcel to Praxair Surface Technologies (a spin-off from Union Carbide) in 1993. As stated in Section 1.1, in August 2007, GM sold the Facility to Clutch Operating Company, Inc.

As identified in the deed between General Motors and Clutch Operating Company, the following restrictions are placed on the property:

1. Allison shall prohibit all uses of the property that are not compatible with the land use restriction placed on the property in accordance with the Performance Based Corrective Action Agreement between the USEPA and GM

2. Allison shall manage all soils, media and/or debris that are excavated or disturbed on the property by Allison in accordance with all applicable state and federal Environmental Laws

3. Allison shall prohibit the use or construction of wells or other devices to extract groundwater for any domestic potable uses (i.e. drinking, showering, cooking or cleaning)

4. Allison is permitted to use dewatering wells or other devices for maintenance or construction purposes, provided the dewatering, including management and disposal of the groundwater is conducted in accordance with all applicable local, state and federal Environmental laws and does not result in a violation of Environmental Laws

5. Allison shall be permitted to use, and have the use of, groundwater at the property in a manner consistent with current uses of groundwater, and at volumes sufficient to meet Allison's water supply requirements for operations and other current uses of such groundwater , and the Corrective Action shall not conflict or interfere with Allison's use of groundwater at the property

6. Allison shall use commercially reasonable efforts not to unreasonably interfere with the operation of any technology, treatment or other activities engaged in by GM or it's affiliates in accordance with their obligations under the Corrective Action

7. If Allison contemplates actions which will materially interfere with the operation of any technology, treatment or other activities engaged in by GM or it's affiliates in accordance with their obligations under the Corrective Action, Allison shall provide prior notice to GM of it's intent to take such action

8. If Allison intends to transfer any interest in the property, Allison shall provide notice to USEPA and IDEM at least 21 days prior to consummating any such transfer. Allison shall not transfer any interest in the property unless the transferee agrees in writing to comply with the terms and conditions of Section

7 of the Asset Purchase Agreement that are applicable to Allison, and GM is provided the right to enforce such written agreement against such transferee.

1.2.3 Current and Historical Operations

Plant 2 was formerly involved in aircraft engine testing, machining, parts cleaning, and warehousing. An expansion on the north side of Plant 2 was added circa 1969, and was used only for warehouse space to support parts distribution activities. An area south of the warehouse, near the center of the Facility, was renovated circa 1993 as a fitness center for Allison employees. Manufacturing at Plant 2 stopped in the mid-1990s. Machinery and supplies formerly used in plant operations were removed from the Facility prior to demolition. Plant 2 was demolished in 2004 leaving only a partial concrete floor slab with remaining areas of the Facility covered with asphalt or limestone gravel. From 1973 to 1993 GM owned a parcel of land north of Plant 2 and used the parcel for surface parking. This parcel appears to have included all or part of four former lagoons that were owned and operated by Union Carbide up to 1973. The lagoons are visible on aerial photographs between 1941 and 1962 (Appendix A of DOCC). By 1972, two of the lagoons were no longer visible in the aerial photograph and the remaining two lagoons appeared to be in the process of being filled. Ownership of the parcel was returned to Praxair Surface Technologies (a spin-off from Union Carbide) in 1993. A memo summarizing an evaluation of the potential connection of this property to the Plant 2 property is presented in Appendix A.

The initial building of Plant 3 was constructed and began operations in 1939 for aircraft engine production and is currently the main transmission manufacturing Facility as well as administrative headquarters for the company. Plant 6, a portion of Plant 3, was constructed in two phases, the first in 1942 and the second in 1966. Plant 7, another portion of Plant 3, was constructed in 1970. Plants 6 and 7 have always been used for production of transmissions. Plant 12 is used for the manufacture and assembly of automatic transmissions. Plant 14 is used primarily for the production of transmissions under government contract.

Manufacturing processes in Plant 3 and Plant 12/14 have not changed significantly since operations began in 1939 although the location of specific operations may have changed over the years. For example, all manufacturing processes have been moved out of Plant 7 and Plant 7 is used for inventory storage. Allison produces automatic transmissions for large- and small-scale commercial, large off-road commercial and military vehicles. The Facility also conducts research and development activities related to transmissions. Parts produced may require one or more manufacturing

processes including machining, cleaning, plating, immersion coating, heat-treating, painting, assembly and product testing. The assembly process may require that the parts be cleaned with a variety of solvents and lubricated with oil. Following the final assembly, each transmission is tested for quality control purposes, a step that requires transmission fluids and various fuels to be utilized on the Facility. Numerous plating lines and machining lines have been located at the Facility over the years, along with approximately 35 degreasers and/or stills. Most degreasers have been taken out of service or have been converted to water-based cleaning solutions or mineral spirits. Prior to the conversion, the degreasers contained various chlorinated solvents, including 1,1,1-trichloroethane (1,1,1-TCA) and tetrachloroethene (PCE).

The majority of the Facility is covered with either structures or pavement. A grassy area including two baseball diamonds are located to the west of Plant 3 and are used for recreational purposes for UAW softball leagues. Big Eagle Creek is located south of the Plant 3 property and flows northwest-southeast. Little Eagle Creek runs through the eastern portion of the Plant 12/14 property and flows north-south. An overview of the land cover at the Facility is presented in Drawing 1.2.3.

Operations at the Facility are regulated under several environmental laws and regulations, including RCRA, Clean Air Act, Clean Water Act, and Toxic Substance Control Act. In addition, the workplace is regulated under the Occupational Safety and Health Administration (OSHA). Operations at the Facility are not expected to significantly change in the foreseeable future.

1.3 Interim Measures

Interim measures are in place at AOIs 40, 51 and 53. In addition, interim measures were planned at AOI 19 prior to the start of the RFI. A pilot test was performed at AOI 26.

1.3.1 AOI 19 – Waste Treatment NAPL Recovery System

An LNAPL has been observed in monitoring well MW-0413-S2, downgradient from the skim basins at the waste treatment area (AOI 19). Characterization of the LNAPL revealed it was a heavy petroleum product (i.e., lubricating oil or mineral oil) and contained polychlorinated biphenyls (PCBs). During the initial sampling event Aroclor 1248 was detected at 14 mg/kg and during a subsequent re-sampling detected at 31 mg/kg. The proposed design includes a specific gravity skimmer pump and product

storage. A work plan presenting the design was submitted to USEPA on October 13, 2006.

1.3.2 AOI 26 – Oil Reclaim Area Pilot Study

The Oil Reclaim Area historically contained elevated levels of VOCs in the groundwater. In 2002 a pilot study was conducted to determine if the impacted groundwater would be suited for enhanced reductive dechlorination (ERD). Three injection wells (IW-0201, IW-0202 and IW-0203) were installed to deliver the molasses to the saturated sand in the south fuel farm (south of the Oil Reclaim Building). After six months of the pilot study, the trichloroethane and trichlorethene concentrations in the groundwater were reduced by 90 % and 99 %, respectively from the baseline concentrations. Based on the results of the pilot study no further remediation was necessary.

1.3.3 AOI 40 - Diesel Fuel Plume Groundwater Recovery System

The Diesel Fuel Plume Groundwater Recovery System (AOI 40) has been in operation since 1973 and was upgraded to increase efficiency and effectiveness in 2001. A layout of the Diesel Fuel Plume Groundwater Recovery System is presented in Drawing 1.3.1.

Since 2001, approximately 16.8 million gallons of groundwater (approximately 6,900 gallons per day) have been pumped from the nine recovery wells (three recovery wells (BW-4, BW-11 and BW-12) are located near the southern edge of the Plant 3 building and six recovery wells (BW-5, BW-6, BW-7, BW-8, BW-9 and BW-10) are located just north of Big Eagle Creek). In October 2005, the recovery system was further upgraded to allow for removal of LNAPL and pre-treatment of the impacted groundwater and subsequent discharge to the Town of Speedway sanitary sewer system. Prior to October 2005 the recovered groundwater and LNAPL were treated in the Allison waste treatment system and then discharged to the Town of Speedway sanitary sewer system. In October 2007, the recovery system was further modified to better accommodate increased recovery of LNAPL.

Prior to October 2007 the discharge of the pre-treated water had been approved by the Town of Speedway through Industrial Waste Discharge Permit Number 2003-1. As a result of GM's August 2007 sale of Allison, ENCORE applied for and received a permit (Permit Number 2007-3) dated October 1, 2007, from the Town of Speedway to discharge to the Speedway sanitary sewer system.

Since the October 2005 upgrade, when discharge to the Town of Speedway's sanitary sewer system began, approximately 2,563,627gallons of pre-treated groundwater have been discharged. From June 2001 through December 2007, the recovery well system has removed approximately 9,905 gallons of total petroleum hydrocarbons (TPH) as measured by analysis of extracted groundwater.

The groundwater recovery system was not operating properly in June 2000 due to the recovery well screens becoming plugged. As a result of the system not operating properly, a diesel fuel sheen was seeping into Big Eagle Creek. A containment boom was installed in the Big Eagle Creek directly downgradient of AOI 40 to mitigate the sheen. Oil-only absorbent booms are attached to the physical containment boom to capture a sheen that was seeping from the bank of the creek. After the 2001 upgrade, the frequency and significance of observable sheen in the creek steadily decreased. The containment boom is maintained to contain and capture any minimal sheen that does enter the creek.

1.3.4 AOI 51 – Soil Vapor Extraction / Groundwater Recovery System

The Soil Vapor Extraction (SVE) System installed at Plant 12 (AOI 51) for the removal of PCE from shallow soils in the vicinity of the former degreaser area has been operational since October 30, 2003. A layout of the Soil Vapor Extraction (SVE) / Groundwater Recovery System is presented in Drawing 1.3.3. In addition, a dense non-aqueous phase liquid (DNAPL) was observed during installation of a few soil borings and monitoring wells in the vicinity of AOI 51 in 2004. A DNAPL recovery system was installed at the same time as the SVE system. However, no DNAPL was recovered so in February 2005, operation of the DNAPL recovery component of the system was discontinued to allow for the installation of a groundwater recovery and treatment system. Since no DNAPL has been recovered, no chemical analysis has been performed on the DNAPL.

Between October 2003 and December 2007, approximately 12.8 tons of PCE have been removed from soil in the vapor phase. A groundwater recovery system was installed in 2007. the system incorporates five previously existing DNAPL recovery wells (now referred to as source area recovery wells), and one new source area recovery well, and eight downgradient hydraulic control groundwater recovery wells. The downgradient hydraulic control groundwater recovery wells recover groundwater from the S2A, S2B and S3 sand and gravel units. The downgradient recovery wells were started in September 2007 and the source area wells were phased into operation

over the next several months. The treatment system includes a DNAPL separator, bag filters and an air stripper to remove the PCE and its degradation products.

In 2007 (as part of Phase III of the RFI), eight soil borings were advanced to collect soil samples for analysis of volatile organic compounds (VOCs) to evaluate the effectiveness of the system through a comparison of current concentrations to pre-IM concentrations. A comparison of this data is presented in Appendix G of this report. Additionally, the soil data collected in 2007 is used to current concentrations of VOCs in soil (i.e., replace pre-IM soil VOC results) for specific locations and intervals as described in Appendix G.

1.3.5 AOI 53 – Transmission Test Assembly Area

The transmission test assembly area contained two transmission test cells and a transmission fluid recycling vault. The transmission test assembly area has been retooled; however, the transmission fluid recycling vault is still in place but is no longer used. A storm water drain, which traverses east to west beneath the northern half of the former test assembly area, connects the roof drains to the storm water sewer. A release was reported to IDEM on September 12, 2001 when automatic transmission fluid (ATF) was observed on the surface of water discharging to a storm water transfer sump near Column V054. To identify the source of the ATF, Allison contracted to have a video inspection of the storm sewer performed. The inspection identified ATF in the pipe connecting the roof drain at Column V46 to the storm sewer. Based on this finding, Allison performed an exploratory excavation inside the building where the roof drain penetrates the concrete flooring. The excavation revealed that ATF had migrated through a small gap in the concrete and entered the drainpipe at a joint just below the concrete. Approximately one cubic yard of soil containing ATF was removed for disposal, the concrete was replaced and the gap between concrete and drainpipe was sealed. A sample of the virgin ATF was collected in September 2001 and analyzed for BNs. No constituents were detected in the ATF; however, the reporting limits were elevated due to the matrix of the sample.

The ATF release was investigated between September 2001 and February 2004 under the direction of IDEM. Based on the investigation, in February 2003, absorbent socks were installed in monitoring wells MW-0111, MW-0203, and MW-0205, which contained evidence of transmission fluid. Periodically, the absorbent socks are checked and replaced if found to be saturated with product. Per manufacturer's specifications, 12 ounces of the polymer contained in the absorbent socks absorbs approximately a half-gallon of liquid-phase hydrocarbon. The absorbent socks are

visually inspected to determine the approximate saturation in order to determine the gallons of transmission fluid absorbed. Approximately 19.6 gallons of product have been removed since February 2003.

1.4 Report Organization

Section 1 presents the introduction to the report, a description of the Facility (including location, ownership, and operations), and a summary of interim measures in place at the Facility.

Section 2 provides an overview of the RFI, including the RFI approach and objectives, a summary of the AOIs investigated during the RFI, a summary of the pre-RFI data screening, and a summary of RFI field investigations.

Section 3 presents a summary of the surrounding and site-specific hydrogeology and geology, local land use, local water supply sources, and regional climate.

Section 4 presents a summary of the RFI results for each AOI investigated. The summary includes a description of the AOI, the scope of investigation and methodologies used during the investigation, a summary of the RFI data, and a discussion of whether the data collected adequately characterizes the soil and/or groundwater at each AOI. In addition, a summary of the conclusions from the Description of Current Conditions (DOCC) is presented for AOIs 1, 32 and 51.

Section 5 presents the baseline human health risk assessment for the areas investigated at the Facility during the RFI.

Section 6 presents the ecological risk evaluation for the Facility.

Section 7 summarizes the findings and conclusions of the RFI.

Section 8 lists the references cited in this report.

Tables and Drawings referenced in the RFI Report are included at the end of the document. A legend containing pertinent information to aid in the review of the Drawings is presented before the other drawings. The databox Drawings contain data collected prior to and during the RFI.

Appendix A presents a summary of the ownership history of a property (which historically contained four lagoons) located north of Plant 2 and an evaluation of potential utility connections between the property with the lagoons and the Plant 2 property.

Appendix B presents boring logs and well construction diagrams for locations installed prior to and during the RFI.

Appendix C presents the laboratory analytical reports and validation summaries for samples collected during the RFI and summary tables of data collected prior to and during the RFI.

Appendix D presents the *Evaluation of Creek Sediment and Surface Water*, previously submitted to USEPA.

Appendix E presents the Human Health Risk Assessment supporting documentation and calculations.

Appendix F presents the *Ecological Habitat Characterization and Preliminary Conceptual Site Model* previously submitted to USEPA.

Appendix G presents a comparison of PCE concentrations in soil prior to operation of interim measures at AOI 51 with current PCE concentrations to evaluate the effectiveness of the SVE interim measures. Additionally, this presents historical samples that are replaced by RFI samples that are used in the risk assessment.

2 Overview of RFI

2.1 RFI Objectives and Approach

The RFI was conducted in accordance with the RFI Work Plan submitted on November 22, 2005 (ARCADIS, 2005b). The field activities were executed in a phased approach to provide an initial investigation, and subsequent characterization of focused areas. In addition, due to changes in the scope of investigation during the three phases of the RFI, the sampling and analysis matrix was updated to accommodate further site characterization activities at the Facility. Due to access limitations, location of utilities, and other physical limitations, several sample locations were adjusted in the field, which varied from the proposed location presented in the RFI Work Plan. A listing of the sample locations where field adjustments were made and an explanation is provided as Table 2.1.1. Drawing 1.2.2 shows all AOIs at the Facility, and identifies those AOIs where sampling activities were focused during the RFI at the Facility.

The objectives of the RFI were as follows:

- Characterize the nature and extent of known or potential releases of hazardous waste and/or hazardous constituents in environmental media at the Facility;
- Assess potential risk to human health and the environment associated with known or potential releases of hazardous waste and/or hazardous constituents from the Facility;
- Collect sufficient data to support the baseline human health risk assessment, ecological risk evaluation, and RCRA Environmental Indicators determinations;
- Determine whether Interim Measures are necessary to control potentially significant current exposure, if any, to human health or the environment; and
- Determine whether corrective measures are necessary to mitigate potentially significant current and/or future risk, if any, to human health or the environment.

Data collected to characterize potential releases at an AOI were used to support the evaluation of potential current or future exposure at each AOI.

Iron has been analyzed prior to or during the RFI at one or more AOIs at the Facility. Iron is not considered to be a constituent of concern at the Facility. Additionally, arsenic is prevalent in soil and groundwater in central Indiana; therefore, concentrations of arsenic at the Facility may occasionally exceed soil or groundwater screening criteria due to natural arsenic levels. There are no known releases at the Facility that specifically contained arsenic.

Additionally, information obtained during the investigation was used to characterize the geology underlying the site and evaluate groundwater flow direction and gradient. This report documents activities conducted through March 2008.

2.2 Pre-RFI Investigation and Data Screening

As described in the DOCC, a screening evaluation was performed using data collected during investigations previously performed at the Facility. The analytical results were compared to conservative screening criteria to determine the need for additional investigation or evaluation. Based on the results of the screening evaluation, further investigation was proposed in fifty-nine (59) AOIs at the Facility and no further action or investigation was proposed for fourteen (14) AOIs.

The following AOIs were identified in the DOCC as requiring no further action or investigation:

- AOI 2-9 - Process Waste Sump
- AOI 7 - Chip Hopper
- AOI 18 - Dock 37 Construction Debris Storage Area
- AOI 20 - Wastewater Holding ASTs
- AOI 21 - Powerhouse
- AOI 34 - Former Shot Peening Baghouse Area
- AOI 37 - Construction Debris Staging Area
- AOI 39 - Used Oil AST
- AOI 41 - Degreasers not included in other AOIs
- AOI 44 - Copper Strip Area
- AOI 48 - Plant 12 North Trenches
- AOI 49 - Plant 12 South & West Trenches
- AOI 52 - Heat Treat/Stripping Area
- AOI 56 - Miscellaneous Releases Not Associated With an AOI

2.3 Field Investigation

2.3.1 Areas Investigated

The following AOIs were identified in the DOCC Report (ARCADIS, 2005a) and the RFI Work Plan (ARCADIS 2005b) as requiring further investigation:

Plant 2:

- AOI 2-1 - Former UST Area A
- AOI 2-2 - Former UST Area B
- AOI 2-3 - Former UST Area C
- AOI 2-4 - Former UST Area D
- AOI 2-5 - Former UST Area E
- AOI 2-6 - Piston Coolant Trenches and Building
- AOI 2-7 - Former Degreaser Area
- AOI 2-8 - Former Tin Plating Area
- AOI 2-10 - Former UST Area 5

Plant 3 and Plant 12/14:

- AOI 1 - Peninsula Area
- AOI 2 - Baseball Diamond Area
- AOI 3 - Plant 7 Swarf Area
- AOI 4 - Plant 7 West Trench
- AOI 5 - Plant 7 East Trench
- AOI 6 - Dump Station and Hydromation
- AOI 8 - Railroad Spur
- AOI 9 - Waste Resin and Monlan System
- AOI 10 - Dexron System – Plant 7
- AOI 11 - Former Flexible Machining System (FMS)
- AOI 12 - Dexron System – Plant 6
- AOI 13 - Plating, Degreasing and Derust Area
- AOI 14 - West Spill Containment Sump
- AOI 15 - Former Gasoline UST and Remediation System
- AOI 16 - Plant 3 Test cells Spill Containment Sump
- AOI 17 - Test Cell 24 Basement
- AOI 19 - Waste Treatment

- AOI 22 - Paint Booth Sump
- AOI 23 - Dexron System – Plant 3
- AOI 24 - Metal Chip Silos
- AOI 25 - East Spill Containment Sump
- AOI 26 - Oil Stores and Reclaim Area
- AOI 27 - Plating Wastewater Sump
- AOI 28 - Maintenance Garage USTs
- AOI 29 - Plant 3 By-products Area
- AOI 30 - Copper Strip Area
- AOI 31 - Heat Treat Area
- AOI 32 - Department 0384 Plating Area
- AOI 33 - Mop Water Stations
- AOI 35 - Scrap metal Storage Area
- AOI 36 - Drum Storage Building Area
- AOI 38 - AST Farm
- AOI 40 - Diesel Fuel Release
- AOI 42 - Plant 14 Heat Treat Area
- AOI 43 - Plant 14 Cyanide/Copper Plating Area
- AOI 45 - Swarf and Shot Peening Storage Area
- AOI 46 - Department 1207 By-products
- AOI 47 - Spill Containment Sump
- AOI 50 - Henry System
- AOI 51 - Former Degreaser Area
- AOI 53 - Transmission Test Assembly Area
- AOI 54 - Oil Stores/Waste Sump
- AOI 55 - Scrap Metal Collection Hoppers
- AOI 57 - Plant 12 Drum Staging Area
- AOI 58 - Big Eagle Creek Outfalls
- AOI 59 - Little Eagle Creek Outfalls
- AOI 60 - Hydraulic Lift Tanks
- AOI 61 - Henry System
- AOI 62 - Process Water Release Area
- AOI 63 - Process Water Release Area (added to AOI list, Spring 2007)

The first phase of investigation was initiated in January 2006. Field activities were conducted from January 2006 through March 2006. In addition to the field activities investigating the AOIs identified above, soil samples were collected as identified in the RFI Work Plan (ARCADIS 2005b) to characterize background metals concentrations in the soil. These data are discussed and evaluated in Section 3.5. The results from the investigation were submitted to the USEPA in an RFI Data Report (ARCADIS, October 2006a).

An additional sampling event, focused on the sediment and surface water in Big Eagle Creek and Little Eagle Creek, was conducted in June 2006 as part of the first phase of investigation.

Based on results from the Phase I investigation, GM recommended further investigation in the following 28 AOIs to further characterize potential releases. The Phase II investigation was discussed with the USEPA on November 1, 2006 and the Work Plan was documented in the Proposed RFI Phase II Investigation Summary (ARCADIS 2006b):

- AOI 1 - Peninsula Area
- AOI 2 - Baseball Diamond Area
- AOI 6 - Dump Station and Hydromation
- AOI 8 - Railroad Spur
- AOI 9 - Waste Resin and Monlan System
- AOI 13 - Plating, Degreasing and Derust Area
- AOI 16 - Plant 3 Test cells Spill Containment Sump
- AOI 17 - Test Cell 24 Basement
- AOI 19 - Waste Treatment
- AOI 25 - East Spill Containment Sump
- AOI 26 - Oil Stores and Reclaim Area
- AOI 27 - Plating Wastewater Sump
- AOI 29 - Plant 3 By-products Area
- AOI 30 - Copper Strip Area
- AOI 31 - Heat Treat Area
- AOI 32 - Department 0384 Plating Area
- AOI 33 - Mop Water Stations
- AOI 40 - Diesel Fuel Release
- AOI 42 - Plant 14 Heat Treat Area

- AOI 43 - Plant 14 Cyanide/Copper Plating Area
- AOI 46 - Department 1207 By-products
- AOI 47 - Spill Containment Sump
- AOI 53 - Transmission Test Assembly Area
- AOI 57 - Plant 12 Drum Staging Area
- AOI 2-1 - Former UST Area A
- AOI 2-2 - Former UST Area B
- AOI 2-4 - Former UST Area D
- AOI 2-6 - Piston Coolant Trenches and Building

The second phase of investigation was initiated in November 2006. Field activities were conducted from November 2006 through February 2007. The results from the investigation were submitted to the USEPA in an updated RFI Data Report (ARCADIS, 2007a).

Based on results from the Phase II investigation, GM recommended further investigation in 23 of the 28 AOIs investigated during Phase II, (AOIs 17, 25, 29, 47 and 53 did not require further investigation), to further characterize potential releases and collect additional groundwater samples to confirm prior results. The Phase III investigation was discussed with the USEPA on July 20, 2007 and the Work Plan was documented in the RFI Phase III Investigation Summary (ARCADIS 2007b):

3 Environmental Setting

3.1 Facility Location

Plant 2 is bounded by industrial property to the north, including Praxair Surface Technologies (a subsidiary of Praxair, which spun-off from Union Carbide in 1992) north of which is the Indianapolis Motor Speedway; a former railroad right-of-way and Electric Steel Castings Company and 10th Street to the south (beyond which is Allison Plant 3); Main Street to the west (beyond which are commercial/retail facilities and residential properties); and a railroad right-of-way property and lime slurry piles (owned by Praxair), Polco Street and Dry Run Creek to the east. Residential properties are located within one-quarter mile west of Plant 2.

West of Plant 12/14 is Allison Plant 3. A residential area and Plant 2 are present north of Plant 3. Big Eagle Creek borders the Plant 3 southern property boundary, south of which is a public golf course. Directly east of Plant 3 is Plant 12/14. West of Plant 3 are residential and commercial properties.

Plant 12/14 is bounded to the east by Holt Road, beyond which are a commercial Facility, a city park, and a residential area. A residential area is to the south of Plant 12/14. North of Plant 12/14 is a Speedway SuperAmerica gas station and Crystal Clean (an oil and solvent reclaim and industrial degreasing service provider), beyond which is the bulk fuel transfer terminal (Marathon Petroleum Company Speedway Terminal).

3.2 Climate

The Marion County climate is influenced by the Great Lakes and has a continental humid climate. Cool air from Canada collides with warm tropical air to bring changes in the climate within days and creates a variability of the seasons (United States Department of Agriculture 1991).

Frequent weather changes come from the passing of weather fronts and associated low and high centers of air pressure across the region. Winds are typically from the southwest, but during the winter months are dominantly from the northwest. The mean daily temperature is 52.5° Fahrenheit (F) (mcc.sws.uiuc.edu). The lowest mean temperature is in January at 26.5° F. The highest mean daily temperature is in July at 75.4° F (mcc.sws.uiuc.edu). These temperature summary data were collected at the Indianapolis International Airport from 1971 through 2000.

The average total annual precipitation for the county is 40.95 inches (mcc.sws.uiuc.edu). The average annual snowfall is 26.9 inches (mc.sws.uiuc.edu). Data collected for precipitation and snowfall amounts was collected between 1971 through 2000 from the Indianapolis International Airport. Average annual lake evaporation for the area is about 33 inches. The 1-year, 24-hour maximum rainfall is approximately 2.5 inches (United States Department of Agriculture1991).

3.3 Surface Water Hydrology

The approximate Facility elevation is 720 feet above mean sea level; the Facility land surface is relatively flat (less than 10 ft change) and slopes gently to the southwest. The Facility is located in the White River watershed, bounded by one tributary (Big Eagle Creek) to the White River and transected by a second (Little Eagle Creek). Big Eagle Creek, which is located south of the Facility's southern property boundary, flows in an east/southeast direction. The smaller Little Eagle Creek, which flows through Allison property just east of the Plant 12/14 building, flows toward the south and intersects Big Eagle Creek approximately 0.74 miles southeast of the Facility. Dry Run Creek is an intermittent creek that runs north-south along Polco Rd, east of Plant 2, where it then turns east-west along the northern boundary of Plant 12/14 and discharges into Little Eagle Creek. Big Eagle Creek and Little Eagle Creek can be found on the aerial photograph (Drawing 1.2.1).

3.3.1 Big Eagle Creek

Big Eagle Creek, a tributary of the White River, is located in the White River Basin and is one of the principal streams flowing through the outwash aquifer in Marion County (Smith, 1983). Groundwater in the upper saturated sand unit at the Facility flows to the south-southeast and discharges into Big Eagle Creek. Since the construction of Eagle Creek Reservoir was completed in 1968, the flow in the creek has been controlled by the Corps of Engineers who operate the dam for Eagle Creek Reservoir, which is located approximately 4.5 miles upstream from the Facility. The arithmetic mean discharge of Big Eagle Creek (USGS Station 03353500, located at Big Eagle Creek and Lynhurst Drive) as calculated by the United States Geological Survey from 1940 to 1980 is 211 cubic feet per second (cfs), the harmonic mean is approximately 12 cfs, and the 7Q10 is 3.3 cfs. (http://waterdata.usgs.gov/in/nwis/uv/?site_no=03353500&PARAmeter_cd=00065,00060,00010).

Allison has a State of Indiana Industrial NPDES permit for storm water discharge into Big Eagle Creek (permit number INR00A155 and SIC Code Number 3568 – power transmission). The permit includes two stormwater outfalls to Big Eagle Creek (A-3-01 (Outfall 001) and A-3-02 (Outfall 002)) (Drawing 3.3.1).

3.3.2 Little Eagle Creek

Little Eagle Creek, a tributary of Big Eagle Creek, has a drainage area of approximately 17.4 square miles (Town of Speedway, IN, 2005) and is part of the Big Eagle Creek watershed. In the vicinity of the Facility, Little Eagle Creek is a losing stream. Little Eagle Creek joins Big Eagle Creek approximately two miles south of the Facility and several miles above the mouth of the White River (Roberts et al., 1955). Little Eagle Creek originates in northwestern Marion County, just east of Eagle Creek Reservoir and is part of the Big Eagle Creek Watershed. Little Eagle Creek flows southwest where it is joined by Guion Creek and Falcon Creek to the north of the Town of Speedway, and then flows south. The mean discharge of Little Eagle Creek (USGS Station 03353600, located at Little Eagle Creek and 16th Street) from 1966 to 1980 is 24 cubic feet per second (cfs) (http://waterdata.usgs.gov/in/nwis/uv/?site_no=03353600&PARAmeter_cd=00065,00060,00010).

Allison has a State of Indiana Industrial NPDES permit for storm water discharge into Little Eagle Creek (permit number INR00A155 and SIC Code Number 3568 – power transmission). The permit includes one stormwater outfall to Little Eagle Creek (A-12-01 (Outfall 004)) (Drawing 3.3.1).

3.3.3 Dry Run Creek

Dry Run Creek is a tributary to Little Eagle Creek that originates north of Plant 14. The creek runs in a subsurface culvert until the culvert emerges and discharges just northeast of the corner of Polco and 10th Streets. From there the creek runs south under 10th Street and then along the north side of Plant 12, before it joins Little Eagle Creek. In the vicinity of the Facility, Dry Run Creek is a losing stream and is intermittently dry. Allison has a State of Indiana Industrial NPDES permit for storm water discharge into Dry Run Creek (permit number INR00A155 and SIC Code Number 3568 – power transmission). The permit includes one stormwater outfall to Dry Run Creek (A-2-01 (Outfall 003)) (Drawing 3.3.1).

3.4 Geology and Hydrogeology

The Facility is located in Marion County, Indiana, which is contained within the Tipton Till Plain physiographic unit. The topography of this unit resulted from Wisconsinan glacial advances. The regional geology of the area around the Facility consists of approximately 140 feet of alluvial and glacial deposits overlying sedimentary bedrock (Harrison 1963). The Pleistocene glacial drift is characterized by clay tills and stream deposits consisting largely of sand and gravel.

3.4.1 Bedrock Geology

Based on a review of the available boring logs, water supply well records and available literature, the bedrock beneath the Facility is the New Albany Shale of the Devonian System. The New Albany Shale is an evenly laminated, deep brown to black, brittle, pyritiferous shale unit (Harrison 1963). The thickness of the shale is approximately 120 feet thick (Harrison 1963, Fenelon 1994). Regionally, the New Albany Shale has a sharp basal contact with underlying limestone and dolomite units (Jeffersonville Limestone of the Devonian System). In the vicinity of the Facility; however, the shale is encountered at 107 feet bgs and extends to about 190 feet bgs. The shale overlies the Jeffersonville limestone that is found at 190 feet bgs.

3.4.2 Unconsolidated Deposits

The Facility is underlain by a sequence of unconsolidated materials consisting of silt/clay and sand and gravel. According to the United States Department of Agriculture (USDA) *Soil Survey of Marion County*, the soil type at the Facility is classified as Urban land-Fox complex, Urban land-Genesee complex, and cut and fill. The Urban land-Fox complex is described as urban land and well to poorly drained soils. Runoff is generally rapid from the urban land and slow on the Fox soils. The soil type at the Facility is described as having a 0 to 3 percent slope. The Urban land-Genesee complex includes urban land, well-drained soils, and small areas of poorly-drained units with a 0 to 2 percent slope. Runoff is generally rapid on the urban land and slow on the Genesee soils.

Geologic cross-sections and a cross-section reference drawing are presented as Drawing 3.4.1 through 3.4.15. Four sand units separated by clay layers have been identified at the Facility and have been designated Units S1 through S4, with S1 being the shallowest and S4 being the deepest. Unit S1 generally occurs from 1 to 16 ft bgs with a basal elevation ranging from 694 to 715 ft mean sea level (msl). Sand unit S2 is

comprised of sand units from 17.5 ft to 46 ft bgs. This sand unit is identified as S2, S2a and S2b because of the likelihood that these sand units are connected and represent one saturated unit. If there is no clay to divide sand unit S2 into two units (S2A and S2B) then the sand unit is identified as Unit S2 in the RFI. Where present, sand unit S2A generally occurs from approximately 13 to 30 ft bgs with basal elevations ranging from 688.87 to 708.12 ft msl. Because of the relative thickness of sand unit S2A (typically ranging from 6.5-11 ft) and the absence of that unit at several boring locations, it is believed that sand unit S2A is discontinuous and may actually be several distinct, isolated lenses. Sand Unit S2B is apparently the uppermost continuous water-bearing unit and is generally present from approximately 17.5 to 46 ft bgs with a basal elevation ranging from 671.96 to 703.65. When a single sand unit is present beneath an upper confining till unit (confining till generally between approximately 10 and 25 ft bgs), the sand unit is identified as S2B. The clay layers separating Units S1 and S2a, and S2a and S2b are absent near the southern property boundary; therefore, the water-bearing sand unit in that area has been designated Unit S2 as that unit is believed to be part of the uppermost continuous water bearing unit. Sand unit S3 is a deeper water-bearing unit that is present from approximately 48 to 61 ft bgs with a basal elevation ranging from 657.9 to 667.3 ft msl. Sand Unit S4 has been identified in two monitoring wells and two soil borings. S4 is encountered from approximately 88 to 107 ft bgs with a basal elevations ranging from 613 to 620 ft msl.

3.4.3 Facility Hydrogeology

Regional groundwater flow in the shallow saturated zone is generally south towards Big Eagle Creek. A groundwater elevation contour map based on the October 2007 depth to groundwater measurements is presented on Drawing 3.4.15 and illustrates the uppermost groundwater potentiometric surface, which includes groundwater levels from both confined and unconfined groundwater conditions. Groundwater beneath Plant 12/14 appears to be confined (groundwater is encountered in sand units between 25 ft and 35 ft bgs, and the potentiometric surface is approximately 17 ft bgs); however, the overlying confining layer is not present near the southern property boundary; therefore, the groundwater is unconfined in that area. Groundwater in the southern portion of the Facility is generally encountered between 25 and 30 ft bgs. Localized groundwater heterogeneities appear to be present at several areas where the shallow depth to clay may result in the presence of perched groundwater at these locations. The October 2007 groundwater data is consistent with previous data collected at the Site (ARCADIS, 2006a; ARCADIS, 2007a). Drawing 3.4.16 presents the perched groundwater surface at the Facility. Drawing 3.4.17 shows the potentiometric surface of the S3 sand unit, which slopes towards the south. Drawing 3.4.18 shows the

potentiometric surface in the vicinity of the diesel fuel plume recovery wells (AOI 40) south of Cossell Road. Drawings 3.4.19, 3.4.20 and 3.4.21 show the potentiometric surface of sand units S2A, S2B and S3, respectively, in the vicinity of the Former Degreaser Area recovery wells (AOI 51).

Generally, the hydrogeologic characteristics beneath the Facility have been assessed using available published literature and data collected during various aquifer tests (pumping tests) conducted at the Facility. During 1983, the United States Geological Survey (USGS) completed a study of the availability of water from the outwash aquifer beneath Marion County (Smith 1983). The USGS estimated the hydraulic conductivity beneath the Facility would be between 50 and 200 feet per day (ft/day), based on lithologic data.

In 1994, Geraghty & Miller, Inc. conducted slug tests on selected monitoring wells to evaluate the saturated hydraulic conductivity of the shallow aquifer materials (Unit S2). The data collected was analyzed using the Bower and Rice method. The estimated hydraulic conductivity ranged from 2.3×10^{-2} centimeters per second (cm/sec) (66 ft/day) to 3.0×10^{-3} cm/sec (9 ft/day) and was generated by calculating the average of all test results. This hydraulic conductivity suggests well sorted sands and glacial outwash (Fetter, 1994).

In December 2001, a groundwater pumping/soil vapor extraction pilot test was conducted in Unit S1 to evaluate the technology's applicability in addressing volatile organic compound (VOC) impacts to soil and groundwater in the vicinity of the Oil Stores and Reclaim Area (AOI 26). Based on aquifer analysis, hydraulic conductivity (1.0×10^{-2} cm/sec) was calculated using the Theis non-equilibrium method. This value, which is within the range of a fine to medium coarse sand, is consistent with the aquifer sediments (Study 2).

In December 2002, a step drawdown test was performed in Unit S2 to evaluate the physical characteristics of the aquifer near the southern property boundary (AOI 40). The data collected was analyzed using Theis' non-equilibrium formula, Cooper and Jacobs' approximation of the Theis formula and the distance drawdown method. Based on the evaluations, the storativity (S) and transmissivity (T) were calculated to be 0.0076 and 1,120 gallons per day per foot, respectively. The approximate hydraulic conductivity was 1.5×10^{-2} cm/sec (41 ft/day) (Study 3).

A combined pumping/soil vapor extraction (SVE) test was performed in both Unit S1 and Unit S2A at the Former Degreaser Area (AOI 51) on June 7, 2002. The data

collected was analyzed using AQTESOLV© aquifer test analysis software. Based on analysis, the average hydraulic conductivity in unit S2A was calculated to be approximately 3.03×10^{-4} cm/sec, which corresponds to silt, sandy silts, clayey sands and till (Study 4, Fetter 1994).

Using historic groundwater level data, the hydraulic gradient beneath the Facility has been estimated to be between 0.00005 and 0.023. Hydraulic conductivity values calculated from pumping tests described above are 1.0×10^{-2} in Unit S1, 3.03×10^{-4} in Unit S2A and range from 2.3×10^{-2} to 3.0×10^{-3} cm/sec in Unit S2. Estimated total volume discharge (per unit width of aquifer) and groundwater flow velocity is calculated and provided in the below table for each abovementioned hydraulic conductivity.

AOI	UNIT	K (cm/sec)	K (ft/day)	Gradient (ft/ft)	q (ft/day)	V (ft/day)
AOI 19	S1	$1.00 * 10^{-2}$	$2.83 * 10^{1}$	.009	2.60	$6.80 * 10^{-1}$
AOI 40*	S2	$1.50* 10^{-2}$	$4.25 * 10^{1}$	.023	9.95	2.61
Site**	S2	$2.30 * 10^{-2}$	$6.52 * 10^{1}$	.005	3.32	$8.69 * 10^{-1}$
Site**	S2	3.00* 10-3	8.50	.005	$4.33 * 10^{-1}$	$1.13 * 10^{-1}$
AOI 51	S2A	$3.03* 10^{-4}$	$8.58 *10^{-1}$	.0000491	$4.29 * 10^{-4}$	$1.12 * 10^{-4}$

NOTES:

* - Cossell Road to Big Eagle Creek
**-Site: includes from Plant 2 to Big Eagle Creek
q = Ki; q is the total volume discharge per unit width of aquifer
v = Ki/n
estimated porosity is 37.5%

3.5 Background Soil Concentrations

Background soil samples were collected to characterize naturally occurring levels of metals in soil at the Facility so that background risks and site-related risks for certain potential exposures can be distinguished in the RFI baseline risk assessment. Consistent with the RFI Work Plan (ARCADIS, 2005), samples were collected from eight locations (BK-0601 through BK-0608) where no manufacturing or management of production materials or wastes is known to have occurred. The locations where the background soil samples were collected are shown in Drawing 1.2.2. At each location, one to three samples were collected at various depths between 0.5 to 10 ft bgs. The boring logs and the analytical data for these samples are in Appendix B and C, respectively. A summary of soil analytical results are presented in Drawing 3.5.1.

During review of the background data, the surface sample at locations BK-0601 was identified as having several metal concentrations high enough to be considered statistical outliers and apparently elevated detection limits for metals that were not detected. The boring log for this location indicates the sample may have contained asphalt and surficial fill materials not representative of the native soil at the Facility. Therefore, this sample was removed from the background data set prior to any use of the background data.

The metal concentrations that have been used in the calculation of soil background levels are summarized in Table 3.5.1. This table includes background data from all surface samples, except for the point removed as discussed above. The data from the surficial samples were not significantly different from the data from the other depth intervals. As surficial soil is more likely contacted by most potential receptor populations, this data were used to determine background soil concentrations at the Facility.

The upper confidence limits (UCLs) presented on these tables are nonparametric bias-corrected and accelerated (BCa) bootstrap confidence limits on the mean (Efron and Tibshirani 1998) calculated from 4,000 bootstrap replications and at a 0.05 level of significance. Nonparametric bootstrap statistical limits are more reliable than parametric statistical limits because, unlike parametric limits, they do not rely on assumptions about distribution shapes that are often difficult to justify. Concentrations of metals in soil at or below these UCLs are considered to be within background levels and not site-related; for concentrations higher than these UCLs, the differences between the concentrations and background UCLs are considered site-related in baseline risk assessment calculations of site-related cumulative cancer and noncancer risks for exposure to soil.

Table 3.5.1 summarizes the UCL calculations for site-specific background levels. As shown on this table, no UCLs were calculated for antimony, beryllium, cadmium, mercury, selenium and silver because these metals were infrequently detected or not detected in the site-specific background samples. The concentrations of these metals in natural soil are considered to be below the detection limits, and no background values are subtracted from concentrations when comparing to screening criteria or calculating site-related risks.

Table 3.5.2 presents the estimates of cancer risk and hazard quotient that are associated with these background levels, based on the exposure and toxicity assumptions for exposure to soil discussed in Appendix E. These background levels

of risks are not included in the site-related risk estimates that are discussed in the baseline risk assessment in Section 5.

3.6 Water Supply

3.6.1 Water Supply Survey

A review of the available water well records maintained by the Indiana Department of Natural Resources (IDNR) was conducted to identify any potable or nonpotable water supply wells in the area surrounding the Facility. IDNR classifies wells by their capacity; wells producing less than 70 gallons per minute (gpm) are classified as low capacity wells and wells producing greater than 70 gpm are classified as high capacity wells. The review included both low and high capacity wells within a 1/4-mile radius of the Facility. All available well construction logs were examined.

Records for 36 low capacity wells were identified within a ¼-mile radius of the Facility. The depth of the wells ranged from 40 ft to 270 ft below ground surface (bgs). Seven of the wells were completed in bedrock that was encountered at depths ranging from 80 to 127 ft bgs, and the other 29 wells were completed in unconsolidated sand and gravel. Twenty one of the wells are identified as test wells. Copies of water well records are included in Appendix C of the DOCC. One well is located directly downgradient of the Facility at an abandoned metal working facility; however, the well log was not able to be located. No wells were identified within the path of impacted groundwater flow from the Facility.

Twenty-three high capacity wells are located within one-mile of the Facility. Fifteen of these high capacity wells are/were located at the Facility. These high capacity wells ranged in depth from 57 ft to 121 ft bgs. Bedrock was not encountered in any of the wells. Two of the off-Facility wells are downgradient of the Facility and located south of Big Eagle Creek (see Drawing 6 in the DOCC). Twelve of the wells are associated with Allison Transmission. Six wells are associated with the City of Indianapolis and are located north of the Facility.

Twenty-five water wells were visually identified in the residential neighborhood south of Plant 12/14 (see Drawing 3.6.1). These wells are located sidegradient from groundwater impacted by AOI 40 or AOI 51. Two of these visually identified water wells are within a ¼-mile radius of the Facility and included in the 36 low capacity wells discussed above. One property that was visually identified as having a water well is also connected to the Town of Speedway water utility. It is not known if this property

uses the water well for potable purposes. This property is not being billed for sewer service. All of the visually identified water wells on Drawing 3.6.1 are located within No-Well Zone Area 2, which prohibits the installation of or repair/upgrade to a water well for potable purposes. The No-Well Zone is discussed in Section 3.6.4.

In addition to reviewing available water well records, the Town of Speedway and City of Indianapolis Utilities were contacted to determine the source of residential supply water to the south (downgradient) of Plant 3 and Plant 12/14. It was determined that 24 parcels are not connected to the Town of Speedway or City of Indianapolis water and sewer utilities. The 24 parcels are consistent with the 24 parcels where water wells were visually identified. The locations of these parcels are presented in Drawing 3.6.1. Sixty-three of the parcels that are connected to the Town of Speedway or City of Indianapolis water utility are not being billed for sewer utility service.

3.6.2 Facility Non-Potable Water Supply

The Facility's non-potable water supply has been and is currently from groundwater and stormwater. As identified in the deed restriction discussed in Section 1.2.2, Allison may use groundwater at the property in a manner consistent with current uses of groundwater, and at volumes sufficient to meet Allison's water supply requirements for operations and other current uses of groundwater.

Historically there were three water supply wells at Plant 2 (PW-21, PW-22 and PW-23) and twelve water supply wells present at Plant 3 (PW-1 through PW-12). Currently there are six water supply wells being used. Two water supply wells at Plant 2, PW-22 and PW-23, were abandoned in 2003. It is not known when PW-21 was abandoned, but a reconnaissance in 2007 indicated that it was not present. Water supply well PW-1B was taken out of service in 2006. A summary of the production well operational data is presented in Appendix H. In 2006, groundwater production from each of the operating wells was as follows:

- PW-2: 629,000 gallons.
- PW-5A: 0 gallons.
- PW-7A: 18,632,000 gallons.
- PW-10: 0 gallons.
- PW-11: 38,686 gallons.
- PW-12: 17,447 gallons

Extracted groundwater from all these wells is combined and treated to oxidize iron and sand filtration used for turbidity and solids removal prior to use. Supplemental treatment consisting of acid addition, chlorination, and biocide addition is performed prior to groundwater storage in the cooling towers. The treated groundwater is used at the Facility solely for production purposes (cooling towers, boilers, etc.) and non-potable purposes (fire protection).

The stormwater collection basins for the Facility are an additional non-potable water source. During rain events, stormwater is diverted to collection basins. Some of this collected stormwater is treated through sand filters at waste treatment (AOI 19) and is supplied to the Facility for production purposes. The remaining stormwater is discharged to Big Eagle Creek, Little Eagle Creek, or Dry Run Creek through the permitted outfalls.

3.6.3 Facility Potable Water Supply

Plant 3 and Plant 12/14 use city-supplied water for potable purposes. Water was disconnected at Plant 2 prior to demolition. Current and future use of groundwater anywhere at the facility for domestic potable uses (i.e. drinking, showering, cooking or cleaning) is prohibited through the deed of sale as discussed in Section 1.2.2.

3.6.4 Designated Well Areas

Based on communication with the City of Indianapolis Department of Metropolitan Development, the Facility is not located within a well field protection district. The nearest well field protection area (5-year time of travel) is located approximately one half mile to the east-northeast (side gradient) and one quarter mile to the northwest (upgradient) of the Facility. Drawing 3.6.2 shows the area included in the well field protection areas.

Installation of a well in Marion County requires a licensed water well driller to obtain a well permit, which is signed by the Marion County Health Officer. The County Health Officer does not sign well permits for potable wells proposed for installation in a "No-Well Zone", since the groundwater in these areas is not considered suitable for use by humans for drinking, food preparation, washing or other direct human contact (Sec. 18-102 of the Marion County Health Code). A portion of the Facility (Plant 12/14) is within No-Well Zone Area 2, which is presented on Drawing 3.6.3.

3.7 Land Use

The Facility is situated on three properties consisting of Plant 2, Plant 3, and Plant 12/14 in an area zoned for light and heavy industry. The current zoning designation for the Facility and surrounding area is presented on Drawing 3.7.1.

As discussed in Section 2.1.1, the Facility occupies approximately 220 acres on the southeast side of Wayne Township in Marion County, and currently consists of three properties (Plant 2, Plant 3 and Plant 12/14). As documented in the deed of sale, the Site is limited to industrial or commercial use.

The land use patterns at and around the Facility; trends in population and development; the Township's Comprehensive Land Use Plan for this area; and the implications of these factors for future land use at and around the Facility are discussed in the following Sections. The Comprehensive Land Use Plan is depicted in Drawing 3.7.2.

3.7.1 Zoning and Land Use Patterns

Zoning in Wayne Township is divided into 11 districts, which include classes of industrial, commercial, dwelling and other uses. Drawing 3.7.1 shows the zoning districts for the Facility and surrounding area. The zoning districts are defined in the Zoning Ordinance for Marion County, Indiana (http://www.indygov.org/eGov/City/DMD/Planning/Zoning/municode.htm). The majority of the site is zoned as General Industrial; however, the test-track portion of the Facility is zoned as Light Industrial (COI 2006).

The area surrounding the Facility includes the following industrial, commercial, dwelling and special use districts:

North of the Facility: Community Commercial Uses, Light Industrial, and Office Commercial Uses.

East of the Facility: Residential Area.

South of the Facility: Residential Area, Floodway, and Park Area.

West of the Facility: Village and Urban Mixed Use, Residential Area, and Community Commercial Uses.

The diverse range of properties surrounding the Facility, discussed in Section 3.1, is consistent with the current zoning districts. The Wayne Township Comprehensive Plan identifies different areas of the Township as being in various stages of development (COI, 2001). As shown in Drawing 3.7.3, the Facility predominantly lies within a Stage 2 Development Area located in the southwest portion of the northeast corner of Wayne Township. Stage 2 Development Areas are also known as center city revitalization area. A small portion of the Facility (south of Michigan Street and north of Eagle Creek) lies within a Stage 4 Development Area. Stage 4 Development Areas are also known as suburban revitalization area. In the Stage 2 and 4 Development Areas, in which the Facility is located, it is more common for commercial uses to be developed adjacent to or in the middle of residential areas (Wayne Township comprehensive Land Use Plan, 1993). Similarly, heavy industrial/commercial uses are often adjacent to or across from single-family homes (Wayne Township comprehensive Land Use Plan, 1993). Parts of this area developed without the benefit of stringent building codes, zoning, and subdivision regulations, thereby allowing industrial facilities to be located adjacent to industrial properties (Wayne Township comprehensive Land Use Plan, 1993. The development trends and land use plan for the Stage 2 and Stage 4 Development Areas in which the Facility is located are discussed in Sections *3.7.2* and 3.7.3, respectively.

Within the immediate vicinity of the Facility are major transportation corridors, which include major roadways. Tenth Street, which bisects Plant 2 and Plants 3 and 12/14, is a four lane road. Grande Avenue, which bisects Plant 3 and Plants 12/14 and Cossell Road, which borders Plant 3 to the south and west, are secondary truck routes. Although such high traffic transportation corridors are unattractive to residential development, they provide essential support to industrial use of the area at and around the Facility.

3.7.2 Economy, Population and Housing Trends

Wayne Township experienced its largest recorded growth period during the 1960s. Wayne Township's population increased markedly between 1960 and 1970, while the 1990 population in Wayne Township remained similar to the 1970 population. Between 1990 and 1998, the Township's population increased by about 6%. Between 1998 and 2000 the Township's population increased by only 0.30% (http://www.stats.indiana.edu/population/PopTotals/historic_counts_twps.html). Overall, the Township experienced a 34% increase in population between 1960 and 2000. The following shows the population trend in Wayne Township from 1960 to

1998 (COI 1993a, 1999 and http://www.stats.indiana.edu/population/PopTotals/historic_counts_twps.html).

Year	Population	Change	% Change
1960	99,722		
1970	126,234	26,512	27%
1980	122,809	-3,425	-2.7%
1990	125,699	2,890	2.4%
1998	133,300	7,601	6%
2000	133,699	399	0.30%

By comparison, the population growth experienced in Wayne Township between 1960 and 2000 (34%) outpaced that of Marion County (23%) during this same timeframe (http://www.stats.indiana.edu/population/PopTotals/historic_counts_twps.html).

According to the Wayne Township Facilities & Services Needs Assessment, "...given the current growth rates and the limited supply of buildable land, build-out is likely to occur in 20 to 30 years." (COI 1999, p. 6). Build-out population is defined as "the number of people anticipated to be living in Wayne Township in the year when every piece of property has been developed." (COI 1999, p.6). The build-out population for Wayne Township is projected to be 145,000 persons, which would take 20 to 30 years based on the current growth rate. According to the Facilities & Services Needs Assessment (COI 1999, p.6), once build-out is reached, a population loss is likely because of the current national and local trend towards smaller household sizes.

3.7.3 Speedway Redevelopment Plans

The current Comprehensive Plan developed by the Department of Metropolitan Development, includes 10 critical areas within Wayne Township (COI, 2006). The regions are recognized for historical significance and distinct character. As part of the Comprehensive Plan, recommendations have been made to preserve or redevelop the

areas. Two of the designated Critical Areas are located within close proximity to the Facility. Critical Area 3, located to the west of Plant 2, includes Main Street between 10th and 16th Streets. A few recommendations for this area include expanding Indianapolis Motor Speedway related tourist attractions on the east side of Main Street, where the facilities are compatible with existing industrial uses. Development of new residential areas within the area is not recommended due to local industrial history (COI, 2006).

Critical Area 7 is located south of the Facility and across Eagle Creek bordering the south edge of the Facility property. A few recommendations for this area include the restriction of industrial site expansion to areas northwest or northeast of the Rockville Road/Gasoline Alley intersection, and the transformation of the Eagle Creek corridor to a recreational area (COI, 2006).

The Speedway Redevelopment Commission was created by the Speedway Town Council to redevelop blighted areas in Speedway, Indiana. The Commission is working with Allison to redevelop a portion of Plant 2 (Drawing 3.7.4). According to Allison, this may include retail, restaurant, etc. along Gilman Street, which is currently the entrance to the property. There is a plan that may include extending Gilman Street to Polco St to the east. This would involve neighboring property owners making changes to their existing operations. Additionally, the Commission has also proposed creating a trail that would run along Big Eagle Creek from Lynhurst Avenue to Gasoline Alley (Grande Ave).

4 Investigation Results and Discussion

Section 4 discusses the comparison of analytical results from each environmental medium to conservative screening criteria to determine if potential releases to the environment have occurred and if the field investigation adequately characterized these potential releases. The screening criteria for each environmental medium are discussed below.

The soil characterization data are compared with screening criteria derived from the risk-based preliminary remediation goals (PRGs) published by USEPA Region 9 (USEPA 2004), site-specific vapor intrusion criteria, and soil leaching criteria for protection of drinking water sources. USEPA Region 9 calculates its risk-based PRGs using conservative standard default exposure factors for estimating high-end exposure of workers to soil in commercial/industrial settings. These PRGs were adjusted to a target cancer risk of 10^{-5} and a target HQ of 1 to derive the screening criteria. Site-specific vapor intrusion criteria were calculated based on target cancer risk and HQ of 10^{-5} and 1, respectively. The soil leaching criteria were derived using the procedure outlined in USEPA's Soil Screening Guidance (USEPA 1996) and the drinking water criteria discussed below for protection of drinking water sources. Derivation of these criteria is further discussed in Appendix E.

The groundwater monitoring data are compared with screening criteria based on maximum contaminant levels (MCLs) established under the Safe Drinking Water Act and equivalent drinking water limits for constituents without MCLs, site-specific groundwater vapor intrusion criteria, and groundwater contact criteria. The equivalent drinking water limits are generic risk-based drinking water concentrations calculated using conservative standard default exposure factors for estimating high-end exposure through daily drinking water consumption, and a target cancer risk and HQ of 10^{-5} and 1, respectively. It should be noted that MCLs and equivalent drinking water limits are designed to be protective of potential exposures through drinking water use and represent highly conservative screening criteria for evaluating groundwater that is not a current or reasonably expected future drinking water supply. The site-specific vapor intrusion criteria are calculated analogous to the soil vapor intrusion air criteria. The groundwater contact criteria are risk-based criteria calculated using exposure factors for estimating exposure of workers who could contact groundwater during occasional construction activities, and a target cancer risk and HQ of 10^{-5} and 1, respectively. Derivation of these criteria is further discussed in Appendix E.

Borehole water samples were collected from some soil borings that extended into the saturated zone to assist in the assessment of potential groundwater impact and in the placement of groundwater monitoring wells. Although the procedures for collecting borehole water samples were intended to minimize the potential for introducing contaminants (including soil particles) into the sample by the sampling procedure itself, such influence could not be entirely eliminated because of the nature of the sample collection method. As such, the borehole water data do not necessarily represent groundwater quality in the saturated zone or the groundwater quality over the saturated thickness of the water-bearing zone. Therefore, these data do not provide sufficient bases for identifying the presence of a potentially significant release and are not appropriate for use in the risk assessment. However, these data are compared with the conservative screening criteria described above for groundwater to provide another point of reference.

A potentially significant release at an area is identified when the highest concentrations of constituents detected in soil or groundwater at the area are higher than any relevant screening criteria. The presence of constituent concentrations higher than these screening criteria does not mean that the media necessarily poses a significant risk; it only means that the potential to pose a significant risk should be further evaluated considering additional site-specific factors.

All AOIs discussed in Section 4 are evaluated in the human health risk assessment (Section 5) and the ecological risk screening (Section 6), for AOIs identified as potential ecological habitat.

Note that the databox drawings display all data for constituents with concentrations that exceed the criteria discussed above, except the following constituents were excluded to allow more effective use of the figures:

- constituents with concentrations that exceed criteria in only borehole water samples; and,
- constituents that are believed to be unrelated to the Facility and/or were detected only infrequently at low levels.

4.1 AOI 2-1 – Former UST Area A

The Former UST Area A is located in a courtyard near the center of the former Plant 2 building. AOI 2-1 included a total of 16 former USTs and two former sumps that were not identified by the USEPA in the PA/VSI. AOI 2-1 is located outdoors and is covered

with gravel. The building surrounding AOI 2-1 was demolished in the summer/fall of 2004. In addition, a portion of the surrounding concrete slab was removed. The location of AOI 2-1 is shown on Drawing 1.2.2. Additional information on AOI 2-1 is presented in Section 5.63 of the DOCC. The risk-based screening of pre-RFI data for this AOI, as presented in the DOCC, showed that arsenic, benzo(a)pyrene and mercury concentrations in soil exceeded the industrial soil contact criteria. The pre-RFI data also showed that arsenic, chromium (total), cis-1,2-DCE, lead, TCE, and vinyl chloride had concentrations in groundwater at this AOI that exceed the drinking water criteria.

4.1.1 Scope of Investigation

The scope of Phase I of the RFI completed at AOI 2-1 included the installation of monitoring well MW-0615-S2 and the collection of groundwater samples from monitoring wells MW-6-S2, and MW-0615-S2. The intent of the groundwater sampling event was to characterize VOCs and metals in the groundwater. Soil borings were not proposed during Phase I because the pre-RFI data that exceeded screening criteria were thought to be associated with soil that was excavated. However, additional investigation into the pre-RFI data during Phase I determined that these data were actually confirmation samples and represent soil that is still at the AOI. Therefore, during Phase II of the RFI, three soil borings were proposed (SB-02-01-0601 through SB-02-01-0603) to characterize sidewall samples that were collected during prior UST removal/excavation activities. Soil boring SB-02-01-0601 (the purpose of the boring was to further characterize mercury identified in a sidewall sample collected during UST closure activities), was inadvertently not installed during Phase II field work and was inadvertently not discussed during the planning of Phase III. Monitoring well MW-0640-S2 was installed to replace monitoring well MW-6-S2. Monitoring well MW-6-S2 was damaged during demolition activities and was abandoned on February 22, 2007. During Phase III of the RFI, a groundwater sample was collected from MW-0640-S2. The locations of the soil borings and monitoring wells are illustrated on Drawing 1.2.2 and the boring logs are provided in Appendix B. The soil borings and monitoring wells were completed in accordance with the RFI Work Plan (November, 2005).

4.1.2 Discussion of Results

4.1.2.1 Soil Investigation

Two soil borings (SB-02-01-0602 and SB-02-01-0603) were advanced in AOI 2-1 to characterize sidewall samples that were collected during prior UST removal/excavation